

TECHNICAL NOTES

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Effect of Scarification on the Initial Establishment of Northern Red Oak Reproduction

Experiments conducted on the Hardies Creek Timber Harvest Forest^{1/} near Galesville, Wisconsin, show that scarification of the soil coincident with a good acorn crop more than tripled the amount of northern red oak regeneration over that on untreated areas.

The study was initiated about the middle of September 1951. A random check of 162 subplots, each 1 square foot in size, indicated that 46 percent of them contained from 1 to 12 acorns. The overstory comprised a mixture of mature oaks (northern red, white, black, and northern pin), paper birch, and shagbark hickory. In 1949 this 85-year-old sawtimber stand had a gross volume of about 11,000 board feet per acre, and a total basal area of 133 square feet. Eighty-six percent of the volume and 79 percent of the basal area was northern red oak. At the time of scarification, between one-fourth and one-third of the original stand volume had been cut.

Two kinds of seedbed preparation were used. On five $\frac{1}{2}$ -chain by 1-chain plots the soil was broken with an Athens disk. These areas were paired with a similar number of undisked transects of identical size. Mattocks were used to loosen the soil to a depth of 1 to 2 inches on a series of 12 additional plots, each 3.3 feet wide and 33 feet long. Since the purpose here was merely to compare the relative effectiveness of disking versus hand-hoeing in preparing a seedbed for the crop, no checks were established.

A regeneration count was made in July 1952, and again in April 1954.

Both disking and hoeing increased the amount of northern red oak regeneration (table 1). If the number of seedlings under 6 inches in height is used as the index of success, the first count showed a stocking of 2,370 trees per acre on the disked plots versus only 630 trees on the check plots. The per-acre density of these smaller seedlings was 1,633 stems on the 12 plots where the soil had been broken with mattocks. By the end of the second growing season the two methods of scarification gave almost identical results, i.e., 2,930 northern red oak seedlings of all sizes per acre on the disked areas compared to 3,133 on the transects which had been hand-tilled. The check plots had only 930 trees per acre.

Mineral soil was exposed on about 47 percent of the area disked in contrast to a 100-percent bare condition on the hand-hoed plots. The importance of this factor is shown by the fact that 75 percent (161 out of 216) of the newly established northern red oak seedlings found on 50 "disked" milacres in the fall of 1952 were growing on an inorganic seedbed.

Counts were also made of other hardwood regeneration on the various plots (table 2). Disking resulted in an increase in the number of seedlings of all tree species, but the same result was not obtained with hand scarification.

^{1/} Owned by the State of Wisconsin and managed under cooperative agreement between the Wisconsin Conservation Department, the Lake States Forest Experiment Station, and the Extension Service at the University of Wisconsin.

More experiments are needed to evaluate the use of scarification in oak woodlands. Neither the Athens disk nor hand tools appear to offer any practicable solution for the problem of securing natural regeneration in this type. The disk cannot be used safely or efficiently on steep slopes, and hoeing is too slow and expensive for large-scale operations. Perhaps specialized equipment may be the answer to better and cheaper scarification; or perhaps, as various foresters have suggested, the solution may be the controlled use of hogs or other domestic livestock which root or tear up the soil.

Table 1.--Average number and size of northern red oak seedlings on scarified and undisturbed plots one and two growing seasons after treatment

Height of seedlings	: Number of growing : seasons	Number of trees per acre on:		
		Disked	Undisked	Hand-hoed
		: plots	: check plots	: plots
Less than 6 inches	1	2,370	630	1,633
	2	2,510	430	1,733
6 inches to 4½ feet 1/	1	20	140	100
	2	420	500	1,400
Total	1	2,390	770	1,733
	2	2,930	930	3,133

1/ No seedlings were more than 4½ feet tall.

Table 2.--Average number and size of other hardwood^{1/} seedlings on scarified and undisturbed plots one and two growing seasons after treatment

Height of seedlings	: Number of growing : seasons	Number of trees per acre on:		
		Disked	Undisked	Hand-hoed
		: plots	: check plots	: plots
Less than 6 inches	1	200	130	200
	2	330	90	233
6 inches to 4½ feet	1	1,060	810	633
	2	1,580	1,500	1,100
4½ to 9½ feet	1	90	50	33
	2	170	60	33
Over 9½ feet	1	0	0	0
	2	0	10	0
Total	1	1,350	990	866
	2	2,080	1,660	1,366

1/ Variable by plots, but for all scarified areas and checks comprised of 54 percent shagbark hickory, 13 percent American elm, and 8 percent miscellaneous species including bitternut hickory, box elder, quaking aspen, American basswood, white oak, and paper birch.